SPIE Photonics West Convention
27 January - 2 February 1996, San Jose, California USA

1. Abstract Title: Detection of 1 - 100 keV x-rays from high intensity, 500 fs laser-produced plasmas using charge-coupled devices

2. Author Listing: J. Dunn, B.K.F. Young, A.D. Conder and R.E. Stewart
Lawrence Livermore National Laboratory

3. Correspondence: J. Dunn, LLNL, P.O. Box 808, Livermore CA 94551
Tel: (510) 423-1557
Fax: (510) 422-2253
e-mail: dunn6@llnl.gov

B.K.F. Young, mail address as above
Tel: (510) 423-1979
Fax: (510) 422-2253
e-mail: young2@llnl.gov

A.D. Conder, mail address as above
Tel: (510) 422-2032
Fax: (510) 423-9388

R.E. Stewart, mail address as above
Tel: (510) 423-1550
Fax: (510) 423-5998

4. Submission to: Solid State Sensor Arrays: Development and Applications
(Morley Blouke)

5. Presentation: Oral

6. Abstract: We describe a compact ($60 \times 60 \times 75$ mm^3), vacuum compatible, large format (25×25 mm^2, 1024×1024 pixels), charge-coupled device (CCD) camera for scientific imaging and detection of 1 - 100 keV x-rays in laboratory experiments at the Lawrence Livermore National Laboratory. A multi-pin phase (MPP) device with 250 k electron full well capacity, low dark current (10 pA/cm^2 at 25°C) and low read noise (5 electrons rms.) is cooled to -35°C to give the camera excellent 15-bit dynamic range and signal-to-noise response. The intensity and x-ray energy linear response has been determined for optical and x-ray photons. The departure from linearity has been measured to be less than 0.7% for exposure times of 15 orders of magnitude, 10^{-12} - 10^3 s. The inherent linearity and energy dispersive characteristics of CCD cameras are well suited for x-ray photon counting techniques in scientific applications. Results are presented for the detection of 1 - 100 keV Bremsstrahlung continuum, K-shell and L-shell fluorescence spectra emitted from high intensity (10^{18} W cm^{-2}), 500 fs laser-produced plasmas.

7. Keywords: CCD, x-ray detection, laser-produced plasma

*This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract No. W-7405-Eng-48.